SNIA DEVELOPER CONFERENCE
SDC 25
By Developers FOR Developers

Hyatt Regency Santa Clara, CA
September 15-17, 2025

Redfish for Storage Management

Jeff Hilland
Distinguished Technologist, HPE Labs
President, DMTF

www.sniadeveloper.org

Agenda

- DMTF Background
  - Who we are and what we do
- Redfish
  - Local Storage Model
  - Telemetry Changes
  - CXL Changes
  - Other Storage Changes

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DMTF Board Member Companies

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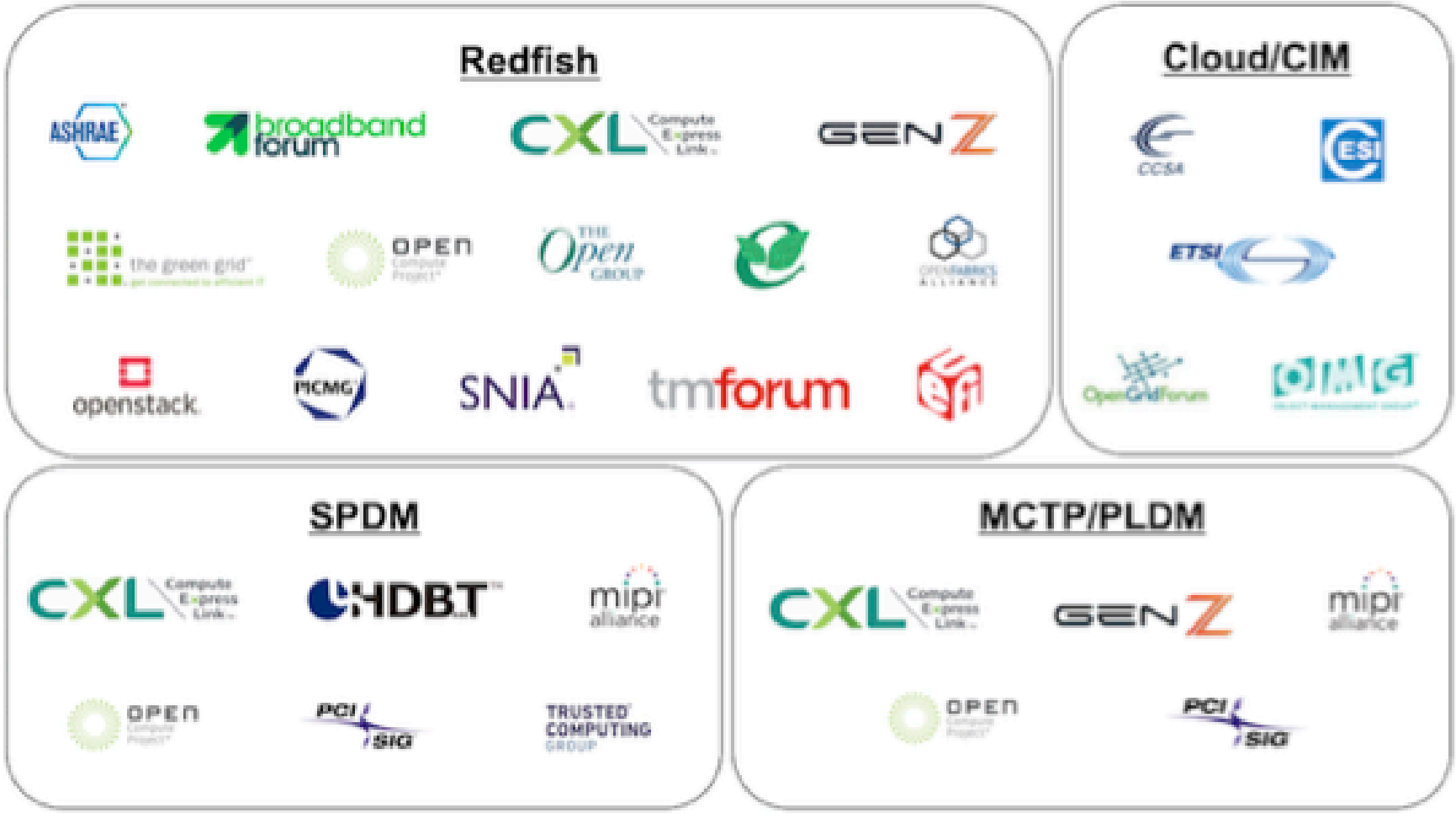
DMTF Alliance Partnership

DMTF and it's Alliance Partners develop a common dialogue and work together for the good of the industry, avoiding overlap and helping ensure interoperability



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DMTF does more than Redfish

- SMBIOS is everywhere
- PMCI
  - MCTP & PLDM: FW Update, Monitoring & Control, FRU, RDE, PLDM, Mappings and Bindings, and NC-SI
  - PMCI Tools TF
- SPDM WG
    - Leveraged by PCIe, OCP, JEDEC, MIPI, CXL, HDBaseT and others
    - Provides Authentication, Attestation and Encryption Key Exchange
    - Includes mapping for MCTP & encrypted MCTP
    - Supports PQC
    - Adding Authorization
  - Security Code TF
    - Libspdm on GitHub has thousands of clones monthly
- CIM
  - Consolidated efforts under a single CIM Forum

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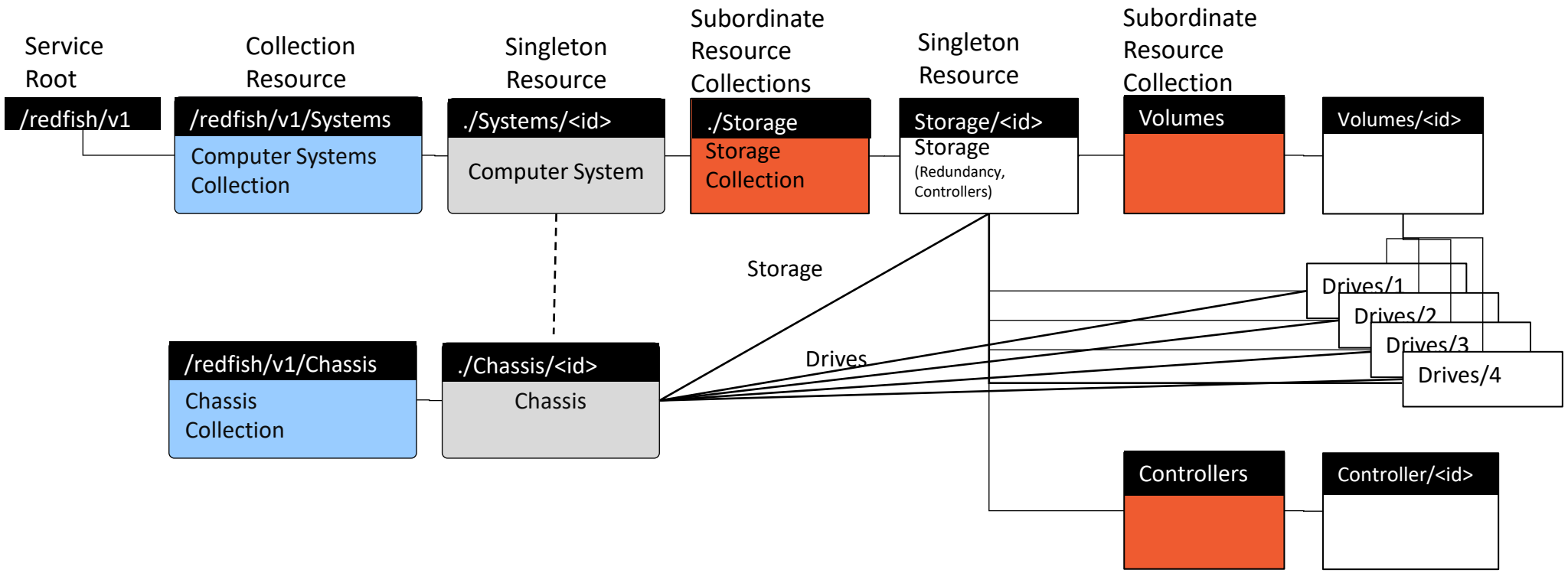
Storage in Redfish: the basics



Note that the Volumes are in Collections off of the Storage resource, drives are in arrays off of the chassis and associated with storage resource (URI can be in either location).

Controllers can either be an object in Storage or their own object (like for NVMe)

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Local Storage Changes

- 2024.4
  - Drive - Added `HardwareVersion` property. Clarified that the `Revision` property should only be used for SCSI drives.
- 2024.3
  - StorageController – Added *MaxAttachedNamespaces* to *NVMeControllerProperties*
- 2024.2
  - *ConfigurationLock* and **NEW** *TargetConfigurationLockLevel* were added to the **Drive** and **Storage** resources
    - Restricts the usage of in-band configurations of the drive or storage subsystems
  - *ConfigurationLock* shows the current lock state and is used by clients to change the lock state
    - "Enabled" – In-band configurations are locked
    - "Disabled" – No locking applied
    - "Partial" – Only some of the desired locking configuration could be applied
      - This value is prohibited from PATCH/PUT operations and is only for reporting purposes
  - *TargetConfigurationLockLevel* specifies the functions to lock
    - "Baseline" – Lock the ability to update firmware, manage security parameters including keys, or perform other hardware configurations
    - For NVMe devices, SNIA's Swordfish "*NVMe Model Overview and Mapping Guide*" defines the specific NVMe commands to lock based on the value
  - For NVMe devices, the *ConfigurationLockState* property in both the **Drive** and **Storage** resources contains supplemental information
    - Shows each NVMe command with their locking status
    - Also shows if the command is supported or can be locked
  - Drive - Added *SetControllerPassword* action

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Device Telemetry – 2025.2

- **NEW** TelemetryData
  - Individual components can generate a large amount of data
    - Internal readings, registers, counters, etc
  - **TelemetryData** provides the original telemetry data from the device
    - No need for the BMC to unpack into the Redfish model
  - Enables clients to directly consume device data
- *CollectTelemetryData* action added to TelemetryService
  - Client specifies which devices to collect telemetry data and the desired format
  - TelemetryData resources are created with the resultant data

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Collecting Device Telemetry

```
POST /redfish/v1/TelemetryService/Actions/TelemetryService.CollectTelemetryData

{
    "TelemetryDataType": "OEM",
    "OEMTelemetryDataType": "ContosoAggregator2_0",
    "TargetDevices": [
        "/redfish/v1/Systems/Sys-1/Processors/P1"
    ]
}
```

Specifies the desired format for the telemetry data.

Specifies the devices from which telemetry is collected.

```
HTTP 200 OK

{
    "TelmetryData": [
        "/redfish/v1/TelemetryService/TelemetryData/TelemetrySnapshot"
    ]
}
```

Resultant telemetry data collected.

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Collecting Device Telemetry (cont)


```
{
    "@odata.id": "/redfish/v1/TelemetryService/TelemetryData/TelemetrySnapshot",
    "@odata.type": "#TelemetryData.v1_0_0.TelemetryData",
    "Name": "TelemetrySnapshot",
    "Timestamp": "2025-11-08T12:25:00-05:00",
    "TelemetryDataType": "OEM",
    "OEMTelemetryDataType": "ContosoAggregator2_0",
    "AdditionalData": "U2FtcGxlVGVsZW1ldHJ5RGF0YQ==",
    "AdditionalDataSizeBytes": 19,
    "AdditionalDataURI": "/redfish/v1/TelemetryService/TelemetryData/TelemetrySnapshot/full-data"
}
```


Format of the telemetry data.

Raw telemetry data.

File containing raw telemetry data.

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CXL Updates – 2025.2

- A CXL switch can contain virtual switches and virtual PCI-to-PCI bridges
  - Used by fabric managers to control switch configuration and downstream port binding
- **NEW** VirtualCXLSwitch
  - New schema that defines a CXL-defined "Virtual CXL Switch"
  - **Switch** resource contains a collection of **VirtualCXLSwitch** resources
  - Replaces *VCS* property in **Switch**
- **NEW** VirtualPCI2PCIBridge
  - Describes a CXL-defined "Virtual PCI-to-PCI Bridge (vPPB)
  - **VirtualCXLSwitch** resource contains a collection of **VirtualPCI2PCIBridge** resources

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Other Changes Affecting Storage

- ConditionType Added to Conditions
  - Allows a service to show subsystem health in a resource
    - Subsystem-related messages are always present in the resource even when their respective health is OK
- Message Registry StorageDevice v1.5.0
  - Added *VolumeRebuilding* and *VolumeReconfiguring* messages
- Message Registry StorageDevice v1.4.0 in 2024.4
  - Added Security ID (SID) related messages
  - Added *BlockSecurityIDIssued*, *BlockSecurityIDFailed*, and *BlockSecurityIDRemoved* messages

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Summary

- Redfish, along with the other DMTF WGs and DMTF alliance partners like SNIA, is working to define interoperable software defined hybrid IT management for servers, storage, networking, power/cooling, fabrics and more
- And is solving problems from security attestation to key exchange, composition to resource managers, aggregation engines to fabric management
- As well as plumbing the mechanisms inside the box to be self contained and self describing
- And enabling a zero-trust model in the platform

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Redfish Developer Hub: redfish.dmtf.org

- Resources
  - Schema Index
  - Specifications
  - GitHub for Redfish Tools
  - Registries
  - Other Documentation
- Mockups
  - Simple Rack-mounted Server
  - Bladed System
  - Proposed OCP Redfish Profile
  - More being added
- Education/Community
  - Redfish User Forum
  - Whitepapers, Presentations
  - YouTube shorts & Webinars

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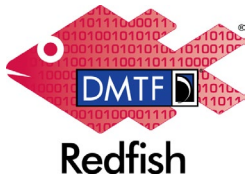

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Background

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Storage Resource Overview

- Storage: A representation of a storage sub-system
  - Contains sets of Volumes, Drives, and Storage Controllers
  - Storage Controller information is an array of objects in the Storage resource
    - Describes the protocols supported by the controller, the speed of the controller interface, and manufacturer information about the controller
- Drive: The physical media for the data
  - Manufacturer information about the drive (part number, serial number, etc.)
  - Capability information about the drive (size, protocol, encryption, etc.)
  - Contains control aspects (secure erase and LED setting)
- Volume: The logical construct used by the OS/hypervisor
  - Contains status about a volume (what drives contribute to the volume, size information, identifier information, etc.)
  - Allows a client to control the volume (initialization, encryption settings, etc.)
- Controller: The physical or logical storage controller
  - Was an array inside of storage (deprecated)
  - Broken out as its own object now (needed for NVMe)

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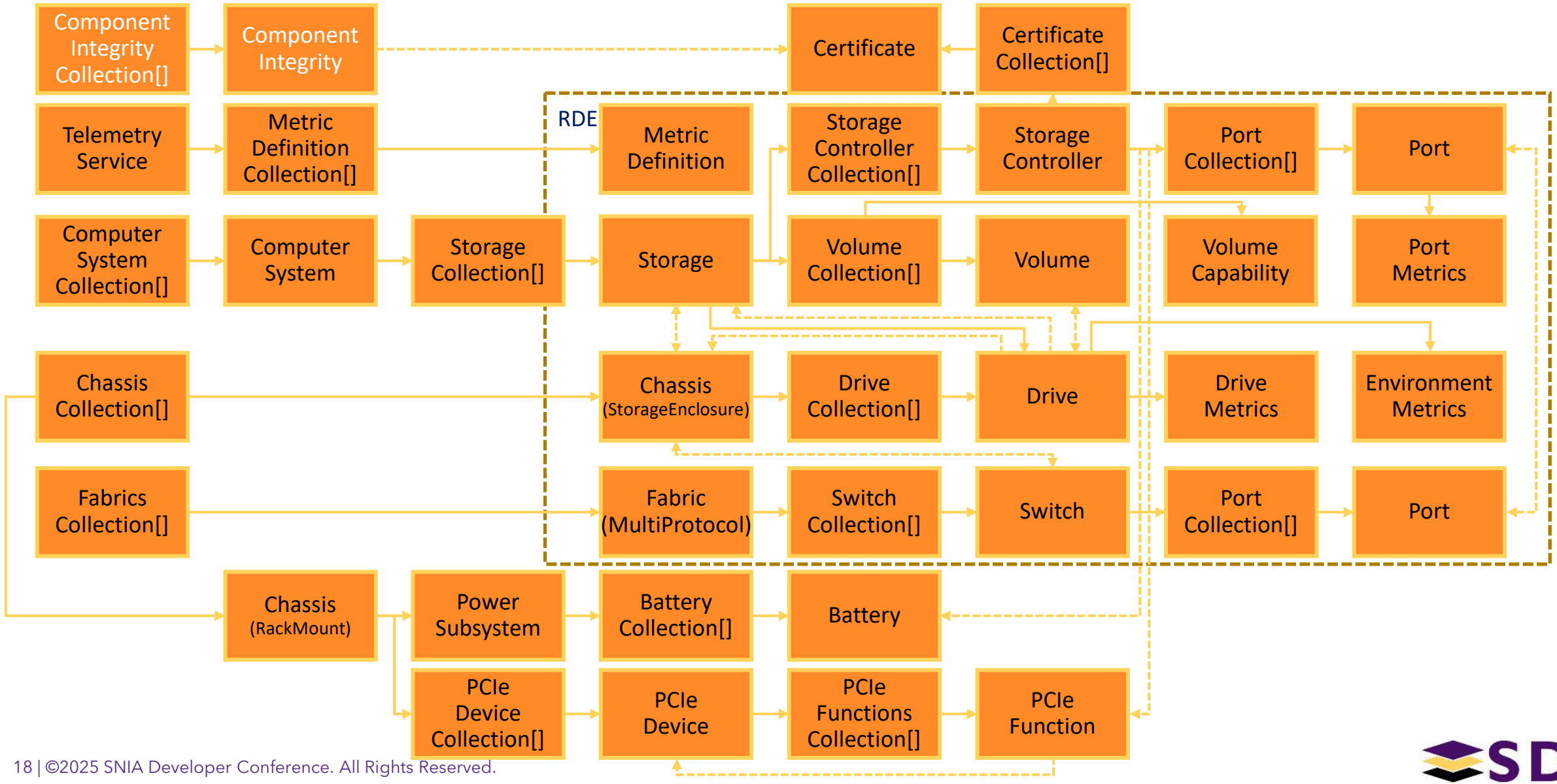
DMTF Redfish Storage Model



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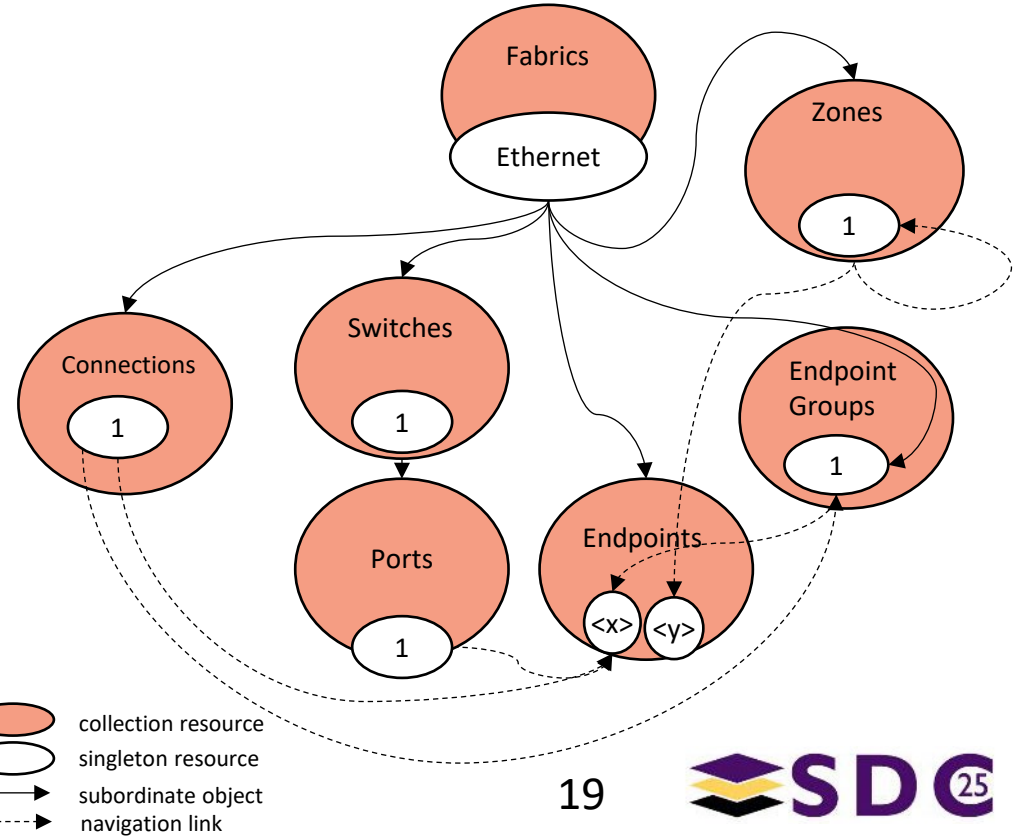
Redfish Common Fabric Model

- Goal is to unify the representation of Fabrics, regardless of fabric type
  - SAS, PCIe, CXL, Ethernet Based, FC all can be shown in this structure
  - Enable client to walk from the controller to the port to the switch port, on through the switches and ports to the target's port and controller.
  - DMTF, OFA & SNIA joint collaboration on the OFMF (Open Fabric Management Framework) in the OFA.
- Simple Representation
  - Collection of Fabrics off of the Service Root
  - Switch
    - Switches have Ports that represent the connection
  - Endpoint
    - Represent the "logical" endpoint, not where the cable ends.
      - Parts of the protocol stack/standard that determine source or destination
  - Zone
    - Represents routing & default behavior.
  - AddressPool (not needed for CXL so not shown)
    - Show address allocation, eBGP, DNS and common endpoint settings
  - Connection
    - Which endpoints are allowed to communicate



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